

PATENT
Docket No. 10191/1629



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant(s): Franz LAERMER et al.

Serial No.: 09/720,761

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For: **METHOD OF PLASMA
ETCHING OF SILICON**

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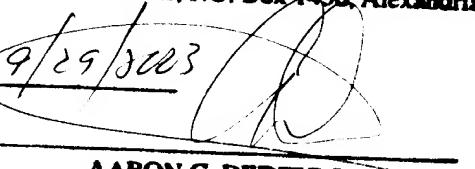
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**AARON C. DEDITCH
(33,865)**

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 1.192(a)

SIR:

In the above-identified patent application ("the present application"), Appellant mailed a Notice of Appeal on July 10, 2003 from a Final Office Action dated April 10, 2003. In the Final Office Action, claims 19 to 36 were finally rejected. An Advisory Action was subsequently mailed on June 18, 2003.

In accordance with 37 C.F.R. § 1.192(a), this Appeal Brief is submitted in triplicate in support of the appeal of the final rejections of claims 19 to 36. The response date is being extended by one month to October 10, 2003 by the accompanying Transmittal and Petition To Extend. For the reasons more fully set forth below, the final rejections of claims 19 to 36 should be reversed.

1. IDENTITY OF REAL PARTY IN INTEREST

The real party in interest in the present appeal is Robert Bosch GmbH, of Stuttgart, Federal Republic of Germany, assignee of the entire right, title and interest in the present application.

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2. RELATED APPEALS AND INTERFERENCES

There are no interferences or other appeals related to the present application "which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal."

3. STATUS OF CLAIMS

Claims 19 to 22 and 24 to 27 stand finally rejected under 33 U.S.C. § 103(a) as unpatentable over the Journal of the Electrochemical Society, Dec. 1982, USA Bd 129, Nr. 12, Pages 2755 to 2760 ("the Flamm reference").

Claims 23 and 28 to 36 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Flamm in view of U.S. Patent No. 5,047,115 ("the Charlet reference").

A copy of the appealed claims is provided in attached Appendix A.

4. STATUS OF AMENDMENTS

In response to the Final Office Action, Appellants filed a Reply Under 37 C.F.R. § 1.116 on July 16, 2002.

5. SUMMARY OF THE INVENTION

The exemplary method of the present invention relates to a method of plasma etching of silicon. Specification, page 1, lines 1 to 4. The method etches a laterally defined structure in a silicon substrate using a process gas. Specification, page 2, lines 18 to 23. The method includes precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching. Specification, page 3, lines 17 to 21. The method further comprises includes a fluorine-delivering etching gas at least from time to time to the process gas, the fluorine-delivering etching gas including at least a compound selected from the group of ClF₃, BrF₃ and IF₅. Specification, page 2, lines 29 and 30.

In another example embodiment of the present invention, a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas is described. The method provides for precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic

plasma etching and during the anisotropic plasma etching. Specification, page 3, lines 17 to 21. The method further provides for adding NF₃ to the process gas as an additive for consuming at least one of the at least one passivating material, SiO₂ and a fluoropolymer material. Specification page 3, line 31 to page 4 line 10.

In another example embodiment of the present invention, a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas is provided. The method provides for precipitating a passivating material on at least one side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching. Specification, page 3, lines 17 to 21. The method further provides for adding at least one of H₂, He and Ne to the process gas. Specification page 4, lines 21 to 29.

In another example embodiment of the present invention, a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas is described. The method provides precipitating at least one passivating material on at least a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching. Specification, page 3, lines 17 to 21. The method also provides for adding at least one fluorine delivering gas to the process gas, the at least one fluorine-delivering etching gas including at least one compound selected from the group consisting of ClF₃, BrF₃ and IF₅. Specification, page 2, lines 29 and 30. The method further provides for adding NF₃ to the process gas as an additive for consuming the at least one passivating material. Specification page 3, line 31 to page 4 line 10. The method further provides for addition at least one of H₂, He and Ne to the process gas. Specification page 4, lines 21 to 29.

Thus, the present invention is directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, which includes: precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and adding a fluorine-delivering etching gas at least from time to time to the process gas, the fluorine-delivering etching gas including at least a compound selected from the group consisting of ClF₃, BrF₃ and IF₅. (See claim 19).

The present invention is also directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, which includes:

precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and adding NF₃ to the process gas as an additive for consuming at least one of the at least one passivating material, SiO₂ and a fluoropolymer material. (See claim 24).

The present invention is also directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, which includes: precipitating a passivating material on at least one side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and adding at least one of H₂, He and Ne to the process gas. (See claim 29).

The present invention is also directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, which includes: precipitating at least one passivating material on at least a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; adding at least one fluorine-delivering etching gas to the process gas, the at least one fluorine-delivering etching gas including at least one compound selected from the group consisting of ClF₃, BrF₃ and IF₅; adding NF₃ to the process gas as an additive for consuming the at least one passivating material; and adding at least one of H₂, He, and Ne to the process gas. (See claim 34).

6. ISSUES

1. Whether Flamm renders unpatentable claims 19 to 22 and 24 to 27 under 35 U.S.C. § 103(a).
2. Whether Flamm in view of Charlet renders unpatentable claims 23 and 28 to 36 under 35 U.S.C. § 103(a).

7. GROUPING OF CLAIMS

Claims 19 to 22 and 24 to 27 stand or fall together as to Issue 1.

Claims 23 and 28 to 36 stand or fall together as to Issue 2.

8. ARGUMENTS

ISSUE 1 - CLAIMS 19 TO 22 AND 24 to 27

In the Final Office Action, claims 19 to 22 and 24 to 27 were finally rejected under 35 U.S.C. § 103(a) as unpatentable over the Flamm reference. It is respectfully

submitted that the rejection of claims 19 to 22 and 24 to 27 under 35 U.S.C. § 103(a) should be reversed for the following reasons.

Claim 19 relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 19 recites that the method includes precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding a fluorine-delivering etching gas at least from time to time to the process gas, the fluorine-delivering etching gas including at least a compound selected from the group consisting of ClF₃, BrF₃ and IF₅.

Claim 24 relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 24 recites precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding NF₃ to the process gas as an additive for consuming at least one of the at least one passivating material, SiO₂ and a fluoropolymer material.

The Flamm reference purports to relate to a multiple-etchant loading effect and silicon etching in ClF₃ and Related Mixtures.

It is respectfully submitted that Flamm does not disclose or suggest all of the features of independent claims 19 and 24. Claims 19 and 24 both recite the feature of precipitating at least one passivating material at least on a side wall of the laterally defined structure. The Flamm reference does not disclose or even suggest a passivating material. The Final Office Action contends that the “polymer” Flamm corresponds to the passivating material recited in claims 19 and 24. The Flamm reference, however, does not disclose or suggest that the “polymer” would have any passivating properties at all. For this reason alone, Flamm does not disclose or suggest all of the features of claims 19 and 24.

The Flamm reference, in fact, teaches away from having a “polymer” used as a passivating material, since it states that there are specific side effects associated with many of these gases or gas mixtures that may be harmful or helpful in some processes. (Flamm, page 2755, col. 2, lines 2 to 5). For example, CF₄ plasmas can deposit polymer if they are ‘loaded’ with a large area of silicon, while pure SF₆ plasmas form polymeric sulfur-containing films under heavily loaded conditions. (Flamm, page 2755, col. 2 line 5 to page 2756 line 1). The presence of CF_x radicals in some fluorocarbon-based etchants is detrimental because they attack SiO₂. (Flamm, page 2755-56). As described above, CF_x radicals are detrimental.

Applicants respectfully further submit that the use of the word “similarly” indicates that the contents of the previous sentence are also detrimental. As a result, CF₄ plasmas which deposit polymer if they are “loaded” with a large area of silicon, and pure SF₆ plasmas which form polymeric sulfur-containing films under heavily loaded conditions are detrimental. The Flamm reference also suggests that the polymers may attack the SiO₂, so they are detrimental.

The Flamm reference is also deficient since it does not disclose or suggest that the at least one passivating material is precipitated on at least one side wall, and it also does not disclose or suggest placement of the polymer (it is not conceded that the polymer corresponds to the passivating material) on at least the side of a laterally defined structure. The Flamm reference, as indicated in Figure 1, refers to removing polysilicon material but it does not disclose or suggest the feature of precipitating that material on at least one side wall.

In rejecting a claim under 35 U.S.C. § 103(a), the Office bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993).

To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Since the Flamm reference does not disclose or even suggest all of the features of independent claims 19 and 24 as explained above, it is respectfully submitted that the Flamm does not render claims 19 and 24 obvious.

It is respectfully submitted that the cases of In re Fine, supra, and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), make plain that the Final Office Action's generalized assertions that it would have been obvious to modify the reference do not properly support a § 103 rejection. It is respectfully submitted that those cases make plain that the Final Office Action reflects a subjective “obvious to try” standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .

Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [subject matter].

In re Jones, 21 U.S.P.Q.2d at 1943, 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the Final Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Unsupported assertions are not evidence as to why a person having ordinary skill in the art would be motivated to modify or combine references to provide the claimed subject matter of the claims to address the problems met thereby. Accordingly, the Office must provide proper evidence of a motivation for modifying or combining the references to provide the claimed subject matter.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a “technologically simple concept” -- which is not the case here -- there still must be some finding as to the “specific understanding or principle within the knowledge of a skilled artisan” that would motivate a person having no knowledge of the claimed subject matter to “make the combination in the manner claimed,” stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Fed. Cir. 2000) (emphasis added). Again, it is believed that there have been no such findings.

In response to the assertion that in it is “inherent” that materials used in Flamm would result in passivating, the following is submitted:

First, with regard to the use of the anticipation doctrine of “inherency” in an obviousness rejection, the Board of Patent Appeals & Interferences in *Ex parte Schricker* has stated that:

[O]n the one hand the examiner talks in terms of inherency (which is really an anticipation rationale) while on the other hand the examiner talks in terms that it would have been obvious to experiment to divine optimum conditions.

Inherency and obviousness are somewhat like oil and water -- they do not mix well. Claimed subject matter can be anticipated because a prior art reference describes a method which inherently meets the limitations of a claimed method. Claimed subject matter can be unpatentable for obviousness when, notwithstanding a difference between that subject matter and a prior art reference, the claimed subject matter, as a whole, would have been obvious.

(See *Ex parte Schricker*, 56 U.S.P.Q.2d 1723, 1725 (Bd. Pat. App. & Int. 2000) (obviousness rejections vacated and remanded) (citations omitted; unpublished)).

It is therefore respectfully submitted that the Final Office Action wrongly relies on inherency to support an otherwise unsupportable obviousness assertion.

Second, it is respectfully submitted that this “inherency” argument is wholly speculative. If the doctrine of inherency is to be applied, the Office is to provide a “basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics necessarily flows from the teachings of the applied art.” See M.P.E.P. § 2112; emphasis in original; and see, Ex parte Levy, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). Thus, the M.P.E.P. and the case law make clear that simply because a certain result or characteristic may occur in the prior art does not establish the inherency of that result or characteristic. The Office Actions and Advisory Action to date have not provided any technical reasoning to support the inherency argument that the Flamm reference itself teaches against. The Office Actions and Advisory Action merely assert that there is a “same material” which is “used in the same process”. As explained above, Flamm specifically teaches against the concept polymer material being a passivating material, so that there is no objective teaching that the polymer of Flamm would act as a passivating material.

Accordingly, there is no evidence that the reference relied upon, whether taken alone or modified, would provide the features and benefits of claims 19 and 24. It is therefore respectfully submitted that claims 19 and 24 are allowable for these reasons. Reversal of the rejections is therefore respectfully requested.

Claims 20 to 22 depend from claim 19 and therefore include all of the features of claim 19. Claims 25 to 27 depend from claim 24 and therefore include all of the features of claim 24. It is therefore respectfully submitted that Flamm does not render obvious these dependent claims for at least the same reasons as their respective base claims 19 and 24.

In view of the foregoing, it is respectfully submitted that the rejection of claims 19 to 22 and 24 to 27 under 35 U.S.C. § 103(a) should be reversed.

ISSUE 2 - CLAIMS 23 AND 28 to 36

Claims 23 and 28 to 36 were finally rejected as unpatentable over Flamm in view of U.S. Patent No. 5,047,115 (“Charlet”). It is respectfully submitted that the rejections of claims 23 and 28 to 36 under 35 U.S.C. § 103(a) should be reversed.

Claim 23 depends from claim 19 and therefore includes all of the features of claim 19, and claim 28 depends from claim 24 and therefore includes all of the features of claim 24.

The Final Office Action contends that Charlet discloses “that helium or argon . . . may be used in the process of etching silicon substrate so as to ensure the stability

of the discharge and its extension to the substrate.” The Final Office Action also contends that “it would have been obvious to one with ordinary skill in the art to incorporate helium or argon as taught by Charlet in order to ensure the stability of the discharge and its extension to the substrate.” It is first noted The Final Office Action does not even assent that it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the Flamm and Charlet references. As required with 35 U.S.C. § 103(a), obviousness must be measured with reference to that which would have been obvious to a person having ordinary skill in the art at the time the invention was made. The failure of the Final Office Action to measure obviousness with reference to the time the invention was made plainly indicates that the present rejection is based on nothing more than improper hindsight. The Office Actions to date and the Advisory Action do not address this point, and as a result, a statutorily sufficient rejection has not be established.

The Charlet reference does not disclose, or even suggest, precipitating at least one passivating material at least on a side wall, so that it does not cure the critical deficiencies of Flamm as to claims 19 and 24. Therefore, the combination of Flamm and Charlet does not disclose, or even suggest, all of the features of claims 23 and 28. It is therefore respectfully submitted that claims 23 and 28 as allowable.

Claim 29 is directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 29 provides for precipitating a passivating material on at least one side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding at least one of H₂, He and Ne to the process gas.

Claim 34 is directed to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 34 provides for precipitating at least one passivating material on at least a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, adding at least one fluorine-delivering etching gas to the process gas, the at least one fluorine-delivering etching gas including at least one compound selected from the group consisting of ClF₃, BrF₃ and IF₅, adding NF₃ to the process gas as an additive for consuming the at least one passivating material, and adding at least one of H₂, He, and Ne to the process gas.

As explained above, each of claims 29 and 34 includes the feature of precipitating at least one passivating material at least on a side wall of the laterally defined

structure. Even if Flamm and Charlet are combined (the properness of which is not conceded), the result does not disclose, or even suggest, precipitating at least one passivating material at least on a side wall of the laterally defined structure, as in claims 29 and 34. It is therefore respectfully submitted that claims 29 and 34 are allowable.

Claims 30 to 33 depend from claim 29 and are therefore allowable for at least the same reasons as claim 29.

Claims 35 and 36 depend from claim 34, and it is therefore respectfully submitted that Flamm and Charlet does not render obvious these dependent claims for at least the same reasons as claim 34.

In view of the foregoing, it is respectfully submitted that the obviousness rejections of claims 23 and 28 to 36 should be reversed.

As further regards all of the obviousness rejections, in the case of *In re Lee*, 61 U.S.P.Q.2d 1430, 1433-35 (Fed. Cir. 2002), the Court reversed the Board of Appeals for relying on conclusory statements, stating the following:

With respect to Lee's application, neither the examiner nor the Board adequately supported the selection and combination of the Nortrup and Thunderchopper references to render obvious that which Lee described. The examiner's conclusory statements that "the demonstration mode is just a programmable feature which can be used in many different device[s] for providing automatic introduction by adding the proper programming software" and that "another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial" do not adequately address the issue of motivation to combine. This factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher." Thus the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion.

....

In its decision on Lee's patent application, the Board rejected the need for "any specific hint or suggestion in a particular reference" to support the combination of the Nortrup and Thunderchopper references. Omission of a relevant factor

required by precedent is both legal error and arbitrary agency action.

[The] “common knowledge and common sense” on which the Board relied in rejecting Lee’s application are not the specialized knowledge and expertise contemplated by the Administrative Procedure Act. Conclusory statements such as those here provided do not fulfill the agency’s obligation.

[The] Board’s findings must extend to all material facts and must be documented on the record, lest the “haze of so-called expertise” acquire insulation from accountability. “Common knowledge and common sense,” even if assumed to derive from the agency’s expertise, do not substitute for authority when the law requires authority.

Thus, the proper evidence of obviousness must show why there is a suggestion as to the reference so as to provide the subject matter of the claims and its benefits.

In short, there is no evidence that the reference relied upon, whether taken alone or otherwise, would provide the features of the claims discussed above. It is therefore respectfully submitted that the claims are allowable for these reasons.

As further regards all of the obviousness rejections of the claims, it is respectfully submitted that not even a *prima facie* case has been made in the present case for obviousness, since the Office Actions to date never made any findings, such as, for example, regarding in any way whatsoever what a person having ordinary skill in the art would have been at the time the claimed subject matter of the present application was made. (See In re Rouffet, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998) (the “factual predicates underlying” a *prima facie* “obviousness determination include the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of ordinary skill in the art”)). It is respectfully submitted that the proper test for showing obviousness is what the “combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art”, and that the Patent Office must provide particular findings in this regard -- the evidence for which does not include “broad conclusory statements standing alone”. (See In re Kotzah, 55 U.S.P.Q. 2d 1313, 1317 (Fed. Cir. 2000) (citing *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1618 (Fed. Cir. 1999) (obviousness rejections reversed where no findings were made “concerning the identification of the relevant art”, the “level of ordinary skill in the art” or “the nature of the problem to be solved”))). It is respectfully submitted that there has been no such showings by the Office Actions to date or by the Advisory Action.

In fact, the present lack of any of the required factual findings forces both Appellants and this Board to resort to unwarranted speculation to ascertain exactly what facts underly the present obviousness rejections. The law mandates that the allocation of the proof burdens requires that the Patent Office provide the factual basis for rejecting a patent application under 35 U.S.C. § 103. (See In re Piasecki, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984) (citing In re Warner, 379 F.2d 1011, 1016, 154 U.S.P.Q. 173, 177 (C.C.P.A. 1967))). In short, the Examiner bears the initial burden of presenting a proper prima facie unpatentability case -- which has not been met in the present case. (See In re Oetiker, 977 F.2d 1443, 1445, 24, U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992)).

Accordingly, claims 19 to 36 are allowable.

CONCLUSION

For at least the reasons explained above, it is respectfully submitted that claims 19 to 36 are allowable, and reversal of the claim rejections is therefore respectfully requested.

Respectfully submitted,

Dated: 9/29/03

By:

Richard L. Mayer
Reg. No. 22,490

KENYON & KENYON
One Broadway
New York, New York 10004
(212) 425-7200

CUSTOMER NO. 26646

APPENDIX A
TEXT OF CLAIMS ON APPEAL

19. (Amended) A method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, the method comprising the steps of:

precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and

adding a fluorine-delivering etching gas at least from time to time to the process gas, the fluorine-delivering etching gas including at least a compound selected from the group consisting of ClF₃, BrF₃ and IF₅.

20. (Amended) The method of claim 19, further comprising the step of adding at least one gas selected from the group consisting of SiF₄, C₄F₅, C₃F₆, C₄F₁₀, C₃F₈ and C₂F₆ to the process gas as a gas forming the at least one passivating material.

21. (Amended) The method of claim 19, further comprising the step of adding at least one gas selected from the group consisting of O₂, N₂O, NO, NO_x, CO₂, Ar, NO₂ and N₂ to the process gas.

22. (Amended) The method of claim 19, further comprising the step of adding at least one of an additive, a fluoroalkane and NF₃ for consuming the at least one passivating material to the process gas, the at least one passivating material including one of SiO₂ and a fluoropolymer material, and the at least one additive including at least one of CHF₃, CF₄, C₂F₆, C₃F₆, C₄F₈, C₄F₁₀ and C₃F₈.

23. (Amended) The method of claim 19, further comprising the step of adding at least one of H₂, He and Ne to the process gas.

24. (Amended) A method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, the method comprising the steps of:

precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and

adding NF₃ to the process gas as an additive for consuming at least one of the at least one passivating material, SiO₂ and a fluoropolymer material.

25. (Amended) The method of claim 24, further comprising the step of adding a fluorine-delivering etching gas to the process gas, the fluorine-delivering etching gas including at least one compound selected from the group consisting of SF₆, ClF₃, BrF₃ and IF₅.

26. (Amended) The method of claim 24, further comprising the step of adding at least one gas selected from the group consisting of SiF₄, C₄F₈, C₃F₆, C₄F₁₀, C₃F₈ and C₂F₆ to the process gas as a gas forming the at least one passivating material.

27. (Amended) The method of claim 24, further comprising the step of adding at least one gas selected from the group consisting of O₂, N₂O, NO, NO_x, CO₂, Ar, NO₂ and N₂ to the process gas.

28. (Amended) The method of claim 24, further comprising the step of adding at least one of H₂, He and Ne to the process gas.

29. (Amended) A method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, the method comprising the steps of:

precipitating a passivating material on at least one side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching; and

adding at least one of H₂, He and Ne to the process gas.

30. (Amended) The method of claim 29, further comprising the step of adding at least one fluorine-delivering etching gas to the process gas, the fluorine-delivering etching gas including at least one of a compound selected from the group consisting of SF₆, ClF₃, BrF₃ and IF₅.

31. (Amended) The method of claim 29, further comprising the step of adding at least one gas selected from the group consisting of SiF₄, C₄F₈, C₃F₆, C₄F₁₀, C₃F₈ and C₂F₆ to the process gas as a gas forming the at least one passivating material.

32. (Amended) The method of claim 29, further comprising the step of adding at least one gas selected from the group consisting of O₂, N₂O, NO, NO_x, CO₂, Ar, NO₂ and N₂ to the process gas.

33. (Amended) The method of claim 29, further comprising the step of adding at least one of an additive, a fluoroalkane and NF₃ to the process gas for consuming at least one of the at least one passivating material, SiO₂ and a fluoropolymer material, the additive including one of CHF₃, CF₄, C₂F₆, C₃F₆, C₄F₈, C₄F₁₀ and C₃F₈.

34. A method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas, the method comprising the steps of:

precipitating at least one passivating material on at least a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching;

adding at least one fluorine-delivering etching gas to the process gas, the at least one fluorine-delivering etching gas including at least one compound selected from the group consisting of ClF₃, BrF₃ and IF₅;

adding NF₃ to the process gas as an additive for consuming the at least one passivating material; and

adding at least one of H₂, He, and Ne to the process gas.

35. (Amended) The method of claim 34, further comprising the step of adding at least one gas selected from the group consisting of SiF₄, C₄F₈, C₃F₆, C₄F₁₀, C₃F₈ and C₂F₆ to the process gas as the gas forming the at least one passivating material.

36. (Amended) The method of claim 34, further comprising the step of adding at least one gas selected from the group consisting of O₂, N₂O, NO, NO_x, CO₂, Ar, NO₂ and N₂ to the process gas.